



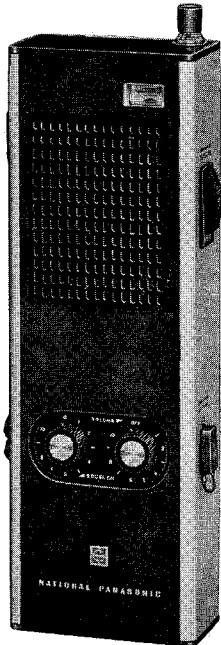
NATIONAL PANASONIC

Service Manual

ORDER NO. RD-498

2-CHANNEL CITIZEN BAND TRANSCEIVER

MODEL **RJ-20E**



SPECIFICATIONS

Frequency :	27 Mc/s Citizen Band	Diodes :	OA90 Detector & AGC
Intermediate Frequency :	455 kc/s	OA90	AF Detector
Transistors :	2SC478 Transmitter Oscillator 2SC456 Transmitter Last Stage Amplifier 2SA341 Receiver RF Amplifier 2SA341 Receiver Converter 2SA101 1st IF Amplifier 2SA101 2nd IF Amplifier 2SB173 1st AF Amplifier 2SB175 2nd AF Amplifier 2SB178 Power & Modulator Amplifier 2SB178 (push-pull) 2SC183 Receiver Squelch	Sensitivity :	1 μ V for 50mW Output 2 μ V for S/N=10 dB Quieting
		Power Output :	Receiver... 500mW Maximum 300mW Undistorted
		Batteries :	Antenna...500mW 12V (Eight "AA" size penlight batteries) (NATIONAL UM-3 or equivalent)
		Speaker & Microphone:	6cm (2 $\frac{1}{4}$) PM Dynamic Speaker, 8 Ω
		Cabinet Dimensions :	85(Wide) \times 254(High) \times 43(Deep) mm (3 $\frac{1}{2}$ " \times 10" \times 1 $\frac{1}{16}$ ")
		Weight :	950g. (2 lb. 1 $\frac{1}{2}$ oz.) with Batteries

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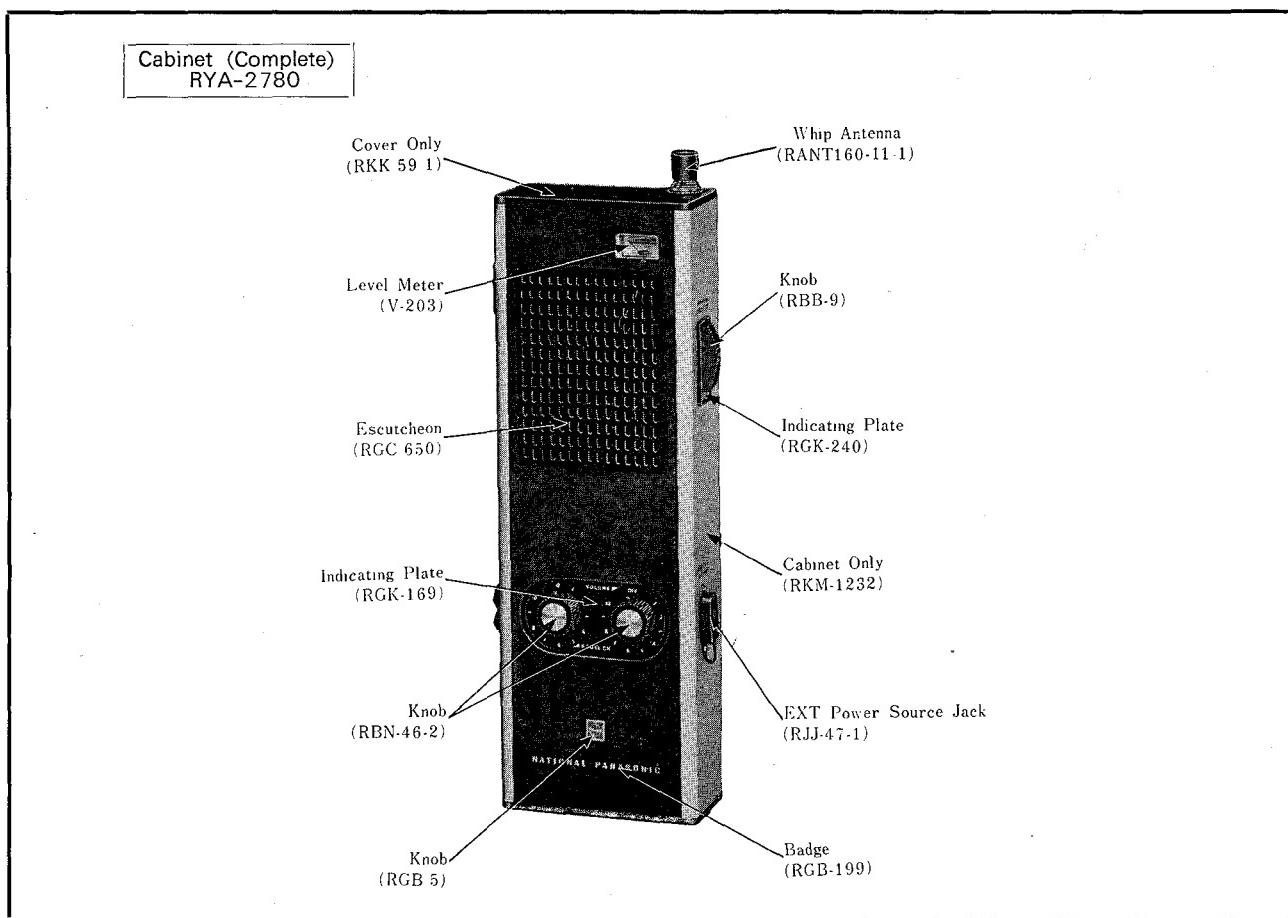


Fig. 1 Cabinet & Appearance - Parts Identification.

DISASSEMBLY INSTRUCTIONS

To Remove Chassis (Refer to Fig. 2, 3 & 4)

1. Remove two (2) control knobs from cabinet front.
2. Hold transceiver in a horizontal position with back side facing up, PUSH the button on the back of the unit and the battery case will eject itself. Do not allow the battery case to fall.

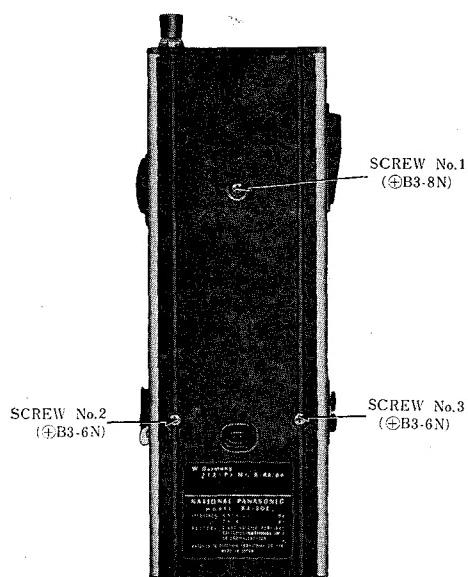


Fig. 2

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3. Remove three (3) cabinet back cover mounting screws, Nos. 1~3, as illustrated in Fig. 2.
4. Remove red whip antenna mounting screw as illustrated in Fig. 3.
5. Remove five (5) red chassis mounting screws, Nos. 1~5, as illustrated in Fig. 4.
6. To remove chassis completely, unsolder leadwires to level meter, earphone, microphone, EXT power source jack and speaker terminals.
7. To reassemble, reverse the above procedure.

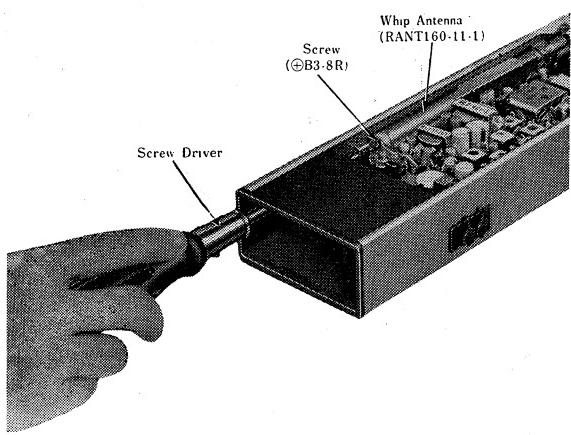


Fig. 3

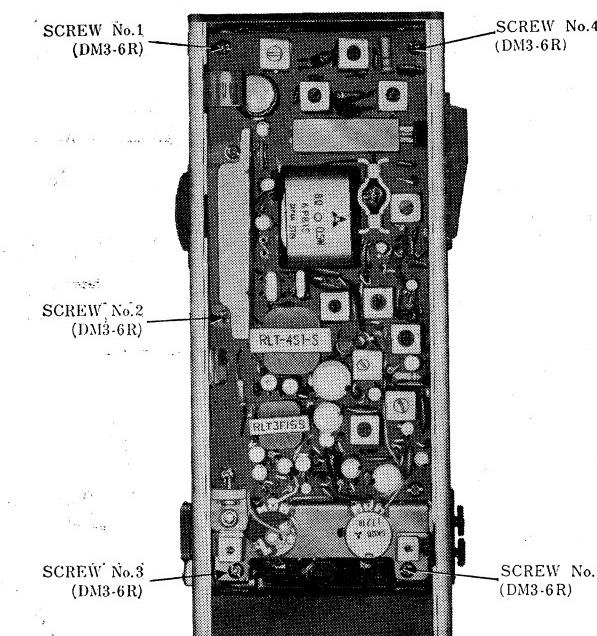


Fig. 4

ALIGNMENT INSTRUCTIONS

Equipment Required

- 1. Signal Generator
- 2. VTVM with RF Probe
- 3. Audio Output Indicator (Voltmeter)
- 4. DC Milliammeter or Tester
- 5. RF VTVM

Note :

Lead connections in set-up should be kept as short as possible

LEVEL METER ALIGNMENT

PROCEDURE

1. Set power source voltage to 12V (DC).
2. Do not apply signal.
3. Adjust 50KΩ potentiometer (R₂₄) so that the pointer of the Level Meter stays as shown in Fig. 5.

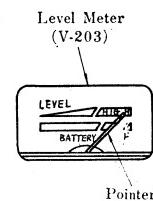


Fig. 5

TRANSMITTER ALIGNMENT

(See Figure 8)

PROCEDURE

- Volume Control.....Maximum.
- Channel Selector Switch.....A or B
- Squelch Control.....Minimum.
- Power Source Voltage.....12V (DC).
- Push To Talk Switch.....Transmitter (Pressed Position)
- Remove shorting link from its terminals and mount it after completing alignment.

Note :

- Do not adjust cores of L₃ and L₄.

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STEP	ALIGNMENT	ADJUST	ADJUSTMENT
1	OSC	L ₁ (OSC COIL)	Adjust L ₁ for maximum indication on VTVM and back down $\frac{1}{2}$ turn.
2	LAST STAGE	L ₂ (LAST STAGE COIL)	Adjust L ₂ for minimum indication on milliammeter.
3	ANT	L ₅ (LOADING COIL)	Adjust L ₅ for maximum indication on milliammeter.
4	CURRENT	R ₈ (CURRENT CONTROL)	Adjust R ₈ for 100mA indication on milliammeter.
5	Repeat Step 1	L ₁	As above
6	ANT	L ₅	Adjust L ₅ for maximum indication on VTVM.
7	LAST STAGE	L ₂	Adjust L ₂ for maximum indication on VTVM.
8	Repeat Step 1	L ₁	As above
9	Repeat Step 1 through Step 4	L ₁ , L ₂ , L ₅ , R ₈	As above, and adjust for 100mA milliammeter reading.

RECEIVER ALIGNMENT

(See Figure 9)

PROCEDURE

- Volume Control.....Maximum.
- Channel Selector Switch.....A or B
- Squelch Control.....Minimum.
- Power Source Voltage.....12V (DC).
- Push To Talk Switch.....Receiver (Unpressed Position).
- Whip Antenna.....Remove from Cabinet.

STEP	ALIGNMENT	SIGNAL GENERATOR	ADJUST	ADJUSTMENT
1	IF	27 Mc/s Band 1000 c/s Mod.	T ₁ , T ₂ , T ₃ (IFT)	T ₁ , T ₂ and T ₃ for maximum audio output.
2	Repeat Step 1	"	"	As above.
3	ANT	"	L ₆ (ANT COIL)	Adjust L ₆ for maximum audio output.
4	DET	"	L ₇ (DET COIL)	Adjust L ₇ for maximum audio output.
5	OSC	"	L ₈ (OSC COIL)	Adjust L ₈ for abrupt indication on audio output, then back down the core (L ₈) 1 turn.
6	Repeat Step 3 through step 5.	"	L ₆ , L ₇ , L ₈	As above

Notes :

1. In all the above alignments, keep signal generator output low enough to maintain reading of 0.5 volts or less on VTVM to avoid AGC action.
2. Use only non-metallic alignment tools to insure proper alignment.
3. After alignment has been completed, all coil slugs that have been moved during alignment should be waxed to insure stability of operation with same type wax originally used.

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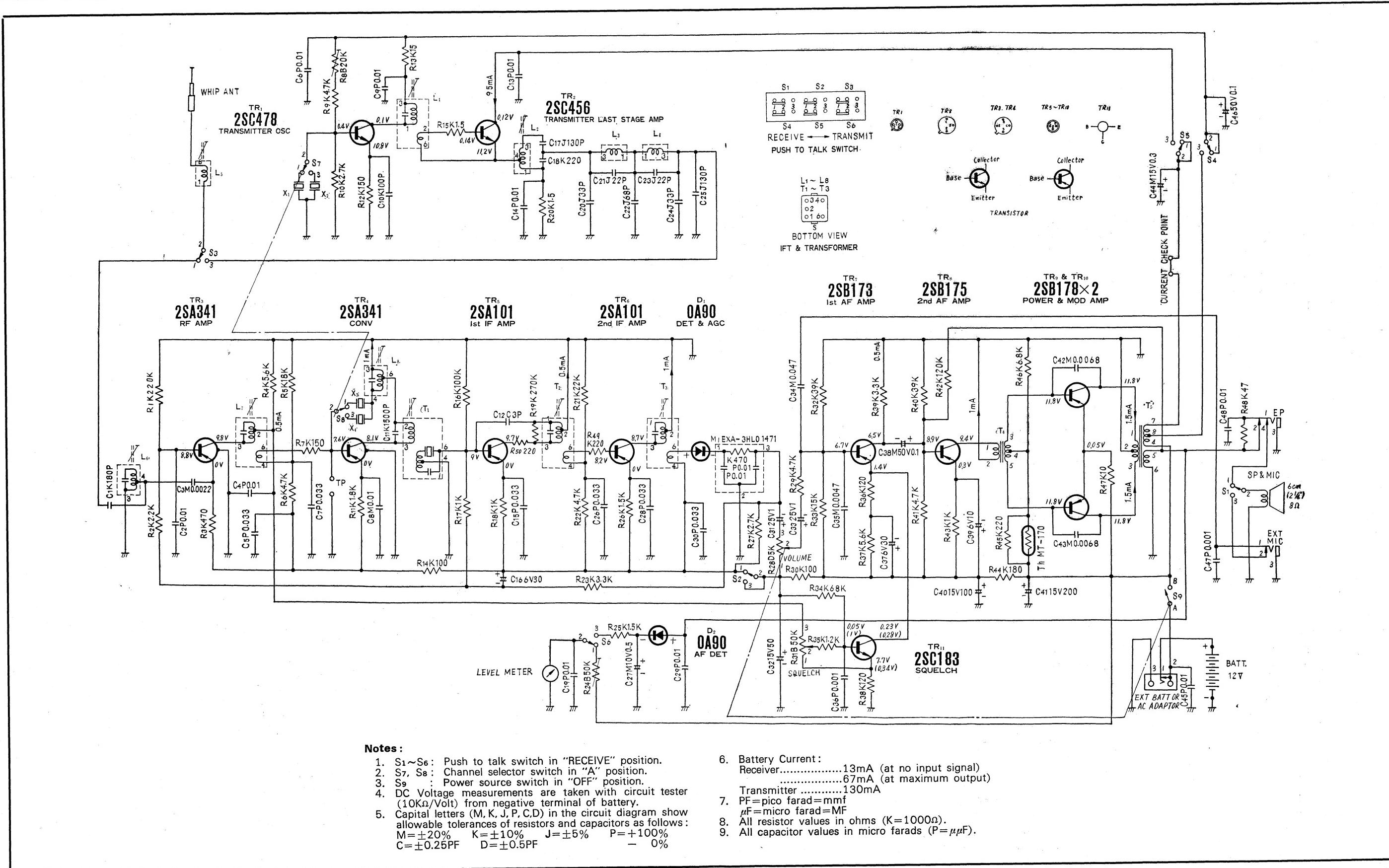
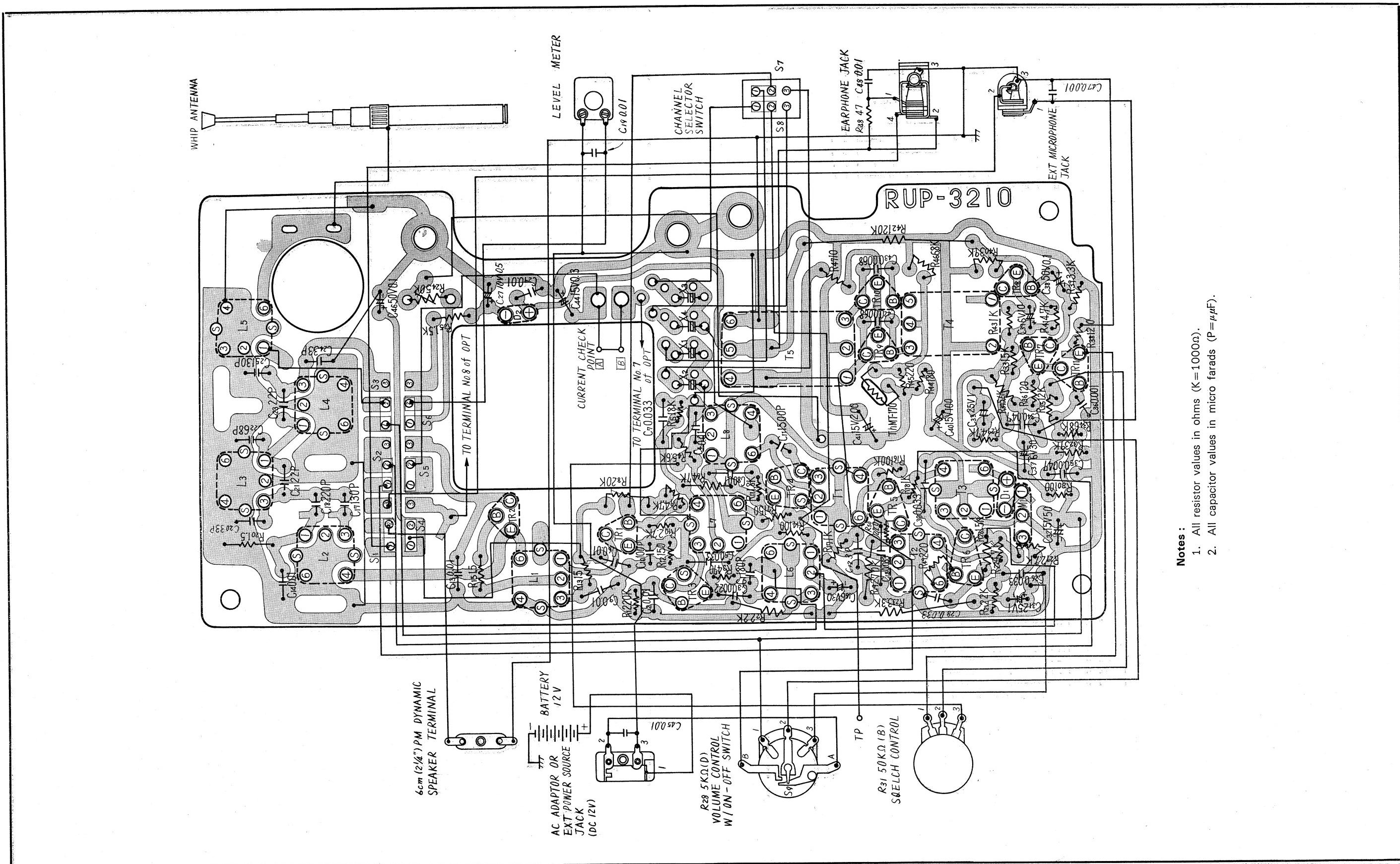


Fig. 6 Schematic Diagram.



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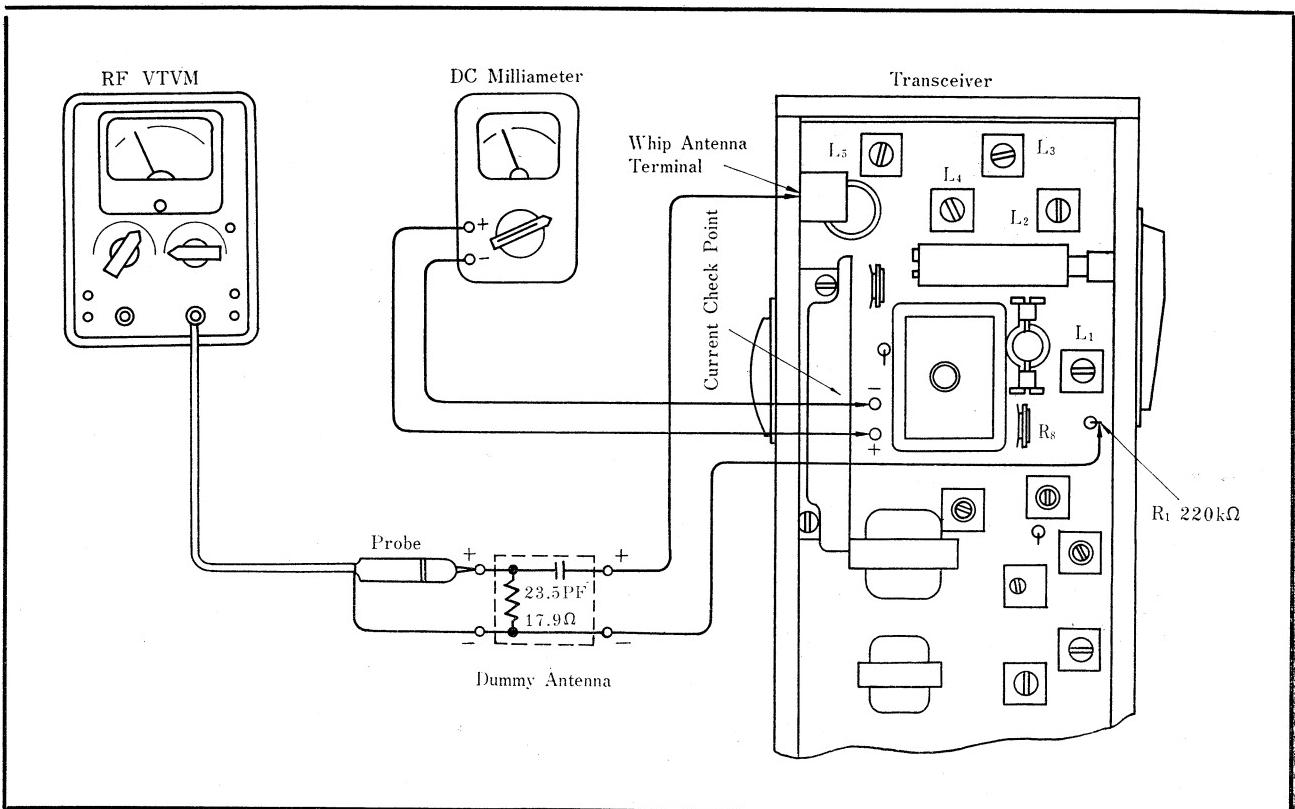


Fig. 8 Test Equipment Set - Up for Transmitter Alignment.

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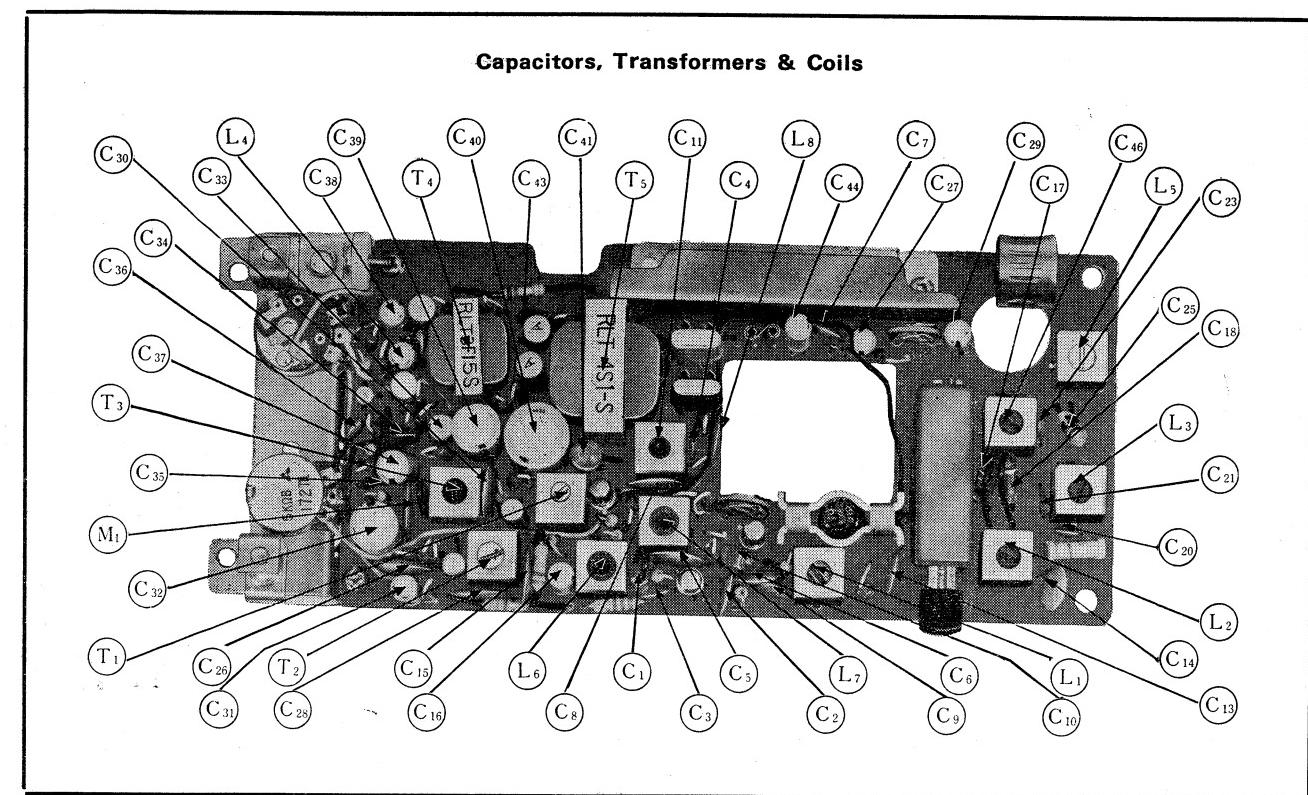


Fig. 10 Component View - Parts Identification.

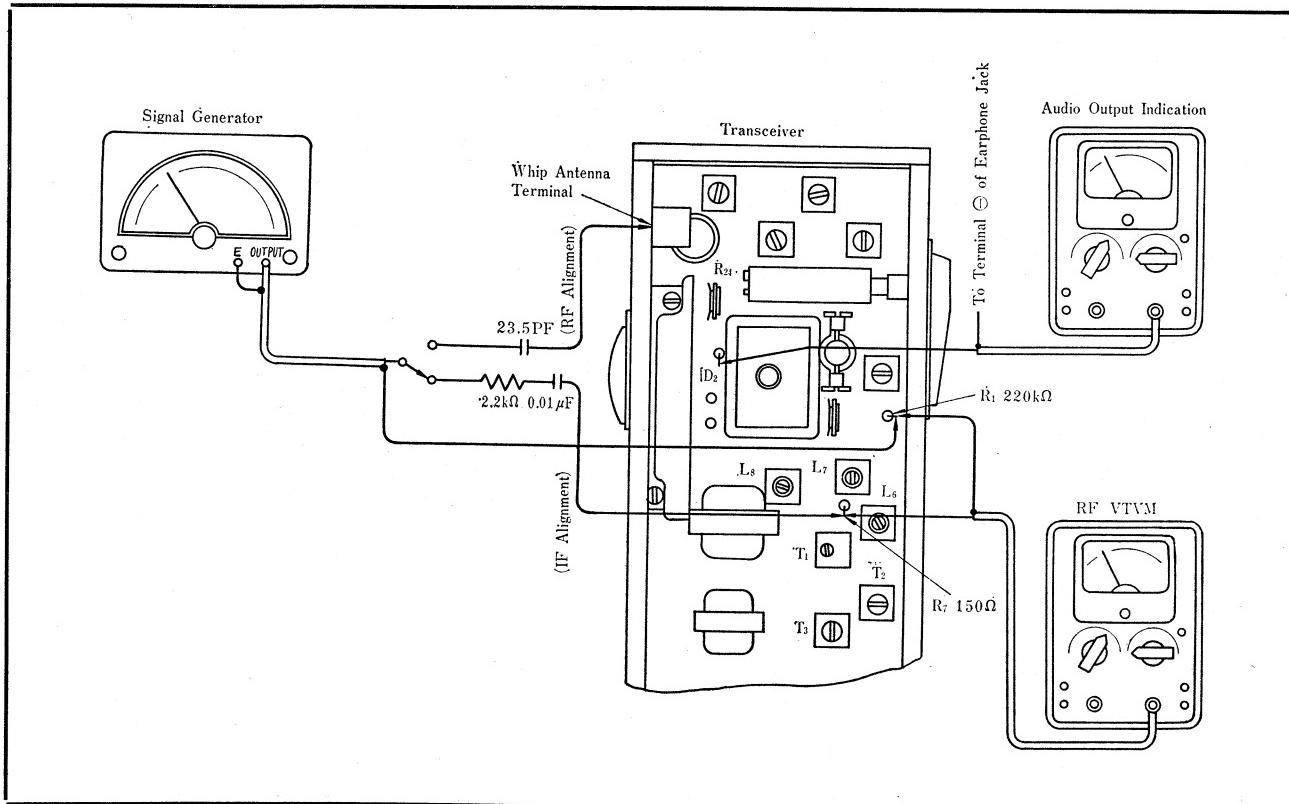
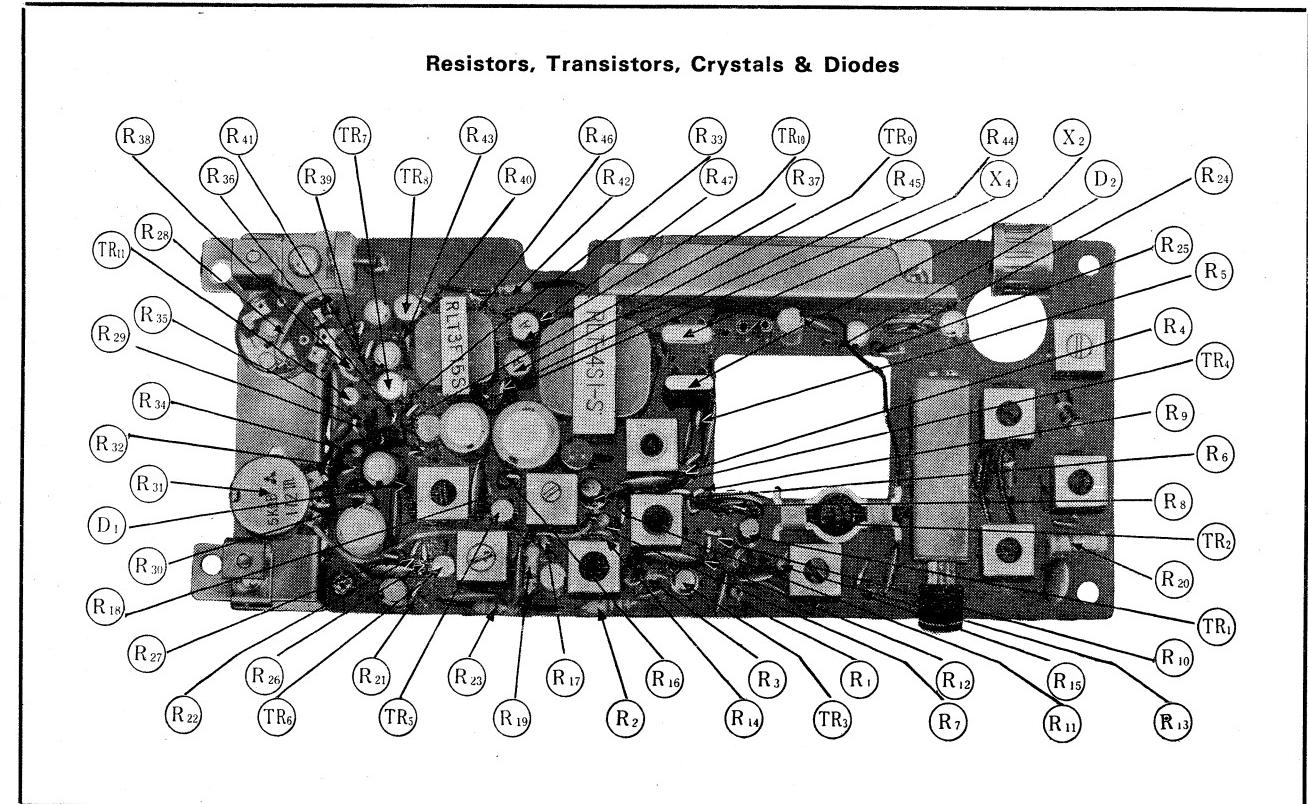


Fig. 9 Test Equipment Set - Up for Receiver IF and RF Alignment.



REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
TRANSISTORS AND DIODES		
TR ₁	2SC478	Transmitter Oscillator
TR ₂	2SC456	Transmitter Last Stage Amplifier
TR ₃	2SA341	Receiver RF Amplifier
TR ₄	2SA341	Receiver Converter
TR ₅	2SA101	1st IF Amplifier
TR ₆	2SA101	2nd IF Amplifier
TR ₇	2SB173	1st AF Amplifier
TR ₈	2SB175	2nd AF Amplifier
TR ₉	2SB178	Power & Modulator Amplifier (push-pull)
TR ₁₀	2SB178	Receiver Squelch
TR ₁₁	2SC183	Detector & AGC
D ₁	OA90	AF Detector
D ₂	OA90	
CRYSTALS		
Freq. Group I :	Usable for following parts numbers:	
X ₁	26.965 (B ₁)→HC-25/U26.965 (B ₂) or 26.965 (B ₃)	
X ₂	27.005 (B ₁)→HC-25/U27.005 (B ₂) or 27.005 (B ₃)	
X ₃	HC-25/U 27.420 (B) Receiver	
X ₄	HC-25/U 27.460 (B) Receiver	
Freq. Group II :		
X ₁	27.055 (B ₁)→HC-25/U27.055 (B ₂) or 27.055 (B ₃)	
X ₂	27.085 (B ₁)→HC-25/U27.085 (B ₂) or 27.085 (B ₃)	
X ₃	HC-25/U 27.510 (B) Receiver	
X ₄	HC-25/U 27.540 (B) Receiver	
Freq. Group III :		
X ₁	27.155 (B ₁)→HC-25/U27.155 (B ₂) or 27.155 (B ₃)	
X ₂	27.185 (B ₁)→HC-25/U27.185 (B ₂) or 27.185 (B ₃)	
X ₃	HC-25/U 27.610 (B) Receiver	
X ₄	HC-25/U 27.640 (B) Receiver	
Freq. Group IV :		
X ₁	27.255 (B ₁)→HC-25/U27.225 (B ₂) or 27.225 (B ₃)	
X ₂	27.275 (B ₁)→HC-25/U27.275 (B ₂) or 27.275 (B ₃)	
X ₃	HC-25/U 27.680 (B) Receiver	
X ₄	HC-25/U 27.730 (B) Receiver	
THERMISTOR		
Th	MT-170	Temperature Compensator
CAPACITORS		
C ₃₆ , C ₄₇	ECK-D05102P	0.001mfd, 50WV, +100%, Ceramic
C ₃	ECK-D05222MY	— 0%, Disc
C ₂ , C ₄ , C ₆ , C ₉ , C ₁₃	ECK-D05103P	0.0022mfd, 50WV, ±20%, Ceramic Disc
C ₁₄ , C ₁₉ , C ₂₉ , C ₄₅ , C ₄₈	ECK-D05103MY	0.01mfd, 50WV, +100%, Ceramic
C ₈	ECK-D05333P	— 0%, Disc
C ₅ , C ₇ , C ₁₅	ECC-D05030C	0.01mfd, 50WV, ±20%, Ceramic Disc
C ₂₆ , C ₂₈ , C ₃₀	ECC-D05220J	0.033mfd, 50WV, +100%, Ceramic
C ₁₂	ECC-D05330J	— 0%, Disc
C ₂₁ , C ₂₃	ECC-D05680J	3mmf, ±0.25mmf, Ceramic
C ₂₀ , C ₂₄	ECQ-S1101KZ	22mmf, ±5%, Ceramic
C ₂₂	ECQ-S1131JZ	33mmf, ±5%, Ceramic
C ₁₀	ECQ-S1181KZ	68mmf, ±5%, Ceramic
C ₁₇ , C ₂₅	ECQ-S1221KZ	100mmf, ±10%, Styrol
C ₁	ECQ-S1152KZ	130mmf, ±5%, Styrol
C ₁₈	ECQ-G05472MZ-N	180mmf, ±10%, Styrol
C ₁₁	ECQ-G05682MZ-N	220mmf, ±10%, Styrol
C ₃₅	ECQ-G05472MZ-N	1500mmf, ±10%, Styrol
C ₄₂ , C ₄₃	ECQ-G05682MZ-N	0.0047mfd, 50WV, ±20%, Polyester
		0.0068mfd, 50WV, ±20%, Polyester

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Ref. No.	Part No.	Description
CAPACITORS		
C ₃₄	ECQ-G05473MZ-N	0.047mfd, 50WV, ±20%, Polyester
C ₃₈ , C ₄₆	ECE-A50V0.1M	0.1mfd, 50WV, Electrolytic
C ₄₄	ECE-A15V0.3M	0.3mfd, 15WV, Electrolytic
C ₂₇	ECE-A10V0.5M	0.5mfd, 10WV, Electrolytic
C ₃₁ , C ₃₃	ECE-A25V1	1mfd, 25WV, Electrolytic
C ₃₉	ECE-A6V10	10mfd, 6 WV, Electrolytic
C ₁₆ , C ₃₇	ECE-A6V30	30mfd, 6 WV, Electrolytic
C ₃₂	ECE-A15V50	50mfd, 15WV, Electrolytic
C ₄₀	ECE-A15V100	100mfd, 15WV, Electrolytic
C ₄₁	ECE-A15V200	200mfd, 15WV, Electrolytic
RESISTORS		
R ₄₈	ERD-14TK 470	47Ω, 1/4Watt, ±10%, Carbon
R ₇	ERD-14TK 151	150Ω, 1/4Watt, ±10%, Carbon
R ₂	ERD-14TK 222	2.2KΩ, 1/4Watt, ±10%, Carbon
R ₂₃	ERD-14TK 332	3.3KΩ, 1/4Watt, ±10%, Carbon
R ₄₂	ERD-14TK 124	120KΩ, 1/4Watt, ±10%, Carbon
R ₁	ERD-14TK 224	220KΩ, 1/4Watt, ±10%, Carbon
R ₁₉	ERD-14TK 274	270KΩ, 1/4Watt, ±10%, Carbon
R ₄₉ , R ₅₀	ERD-14TK 221	220Ω, 1/4Watt, ±10%, Carbon
R ₁₅	ERD-14VK 1R5	1.5Ω, 1/4Watt, ±10%, Carbon
R ₄₇	ERD-14VK 100	10Ω, 1/4Watt, ±10%, Carbon
R ₁₃	ERD-14VK 150	15Ω, 1/4Watt, ±10%, Carbon
R ₁₄ , R ₃₀	ERD-14VK 101	100Ω, 1/4Watt, ±10%, Carbon
R ₃₆ , R ₃₈	ERD-14VK 121	120Ω, 1/4Watt, ±10%, Carbon
R ₁₂	ERD-14VK 151	150Ω, 1/4Watt, ±10%, Carbon
R ₄₄	ERD-14VK 181	180Ω, 1/4Watt, ±10%, Carbon
R ₄₅	ERD-14VK 221	220Ω, 1/4Watt, ±10%, Carbon
R ₃	ERD-14VK 471	470Ω, 1/4Watt, ±10%, Carbon
R ₁₇ , R ₁₈ , R ₄₃	ERD-14VK 102	1KΩ, 1/4Watt, ±10%, Carbon
R ₃₅	ERD-14VK 122	1.2KΩ, 1/4Watt, ±10%, Carbon
R ₂₅ , R ₂₆	ERD-14VK 152	1.5KΩ, 1/4Watt, ±10%, Carbon
R ₁₁	ERD-14VK 182	1.8KΩ, 1/4Watt, ±10%, Carbon
R ₁₀ , R ₂₇	ERD-14VK 272	2.7KΩ, 1/4Watt, ±10%, Carbon
R ₃₉	ERD-14VK 332	3.3KΩ, 1/4Watt, ±10%, Carbon
R ₆ , R ₉ , R ₂₂ , R ₂₉ , R ₄₁	ERD-14VK 472	4.7KΩ, 1/4Watt, ±10%, Carbon
R ₄ , R ₃₇	ERD-14VK 562	5.6KΩ, 1/4Watt, ±10%, Carbon
R ₃₃	ERD-14VK 153	15KΩ, 1/4Watt, ±10%, Carbon
R ₅	ERD-14VK 183	18KΩ, 1/4Watt, ±10%, Carbon
R ₂₁	ERD-14VK 223	22KΩ, 1/4Watt, ±10%, Carbon
R ₃₂ , R ₄₀	ERD-14VK 393	39KΩ, 1/4Watt, ±10%, Carbon
R ₃₄	ERD-14VK 683	68KΩ, 1/4Watt, ±10%, Carbon
R ₁₆	ERD-14VK 104	100KΩ, 1/4Watt, ±10%, Carbon
R ₄₆	ERD-14VK 682	6.8KΩ, 1/4Watt, ±10%, Carbon
R ₂₀	ERW-12L1R5	1.5Ω, 1/2Watt, ±10%, Wire
R ₂₄	EVL-TOAA00B54	50KΩ(B), Level Meter Control
R ₈	EVL-TOAA00B24	20KΩ(B), Current Adjustment
R ₂₈	EVH-BOBL20D53	5KΩ (D), Volume Control W/ON-OFF Switch (S ₉)
R ₃₁	EVH-BOAL20B53	5KΩ (B), Squelch Control
COMPONENT COMBINATION		
M ₁	EXA-3HLO1471	0.01mfd, 0.01mfd & 470Ω
COILS AND TRANSFORMERS		
L ₁	RLO-7C6-T	Transmitter Oscillator Coil
L ₂	RLA-7C5-T	Transmitter Last Stage Coil
L ₃	RLA-7C6-T	Low Pass Filter Coil
L ₄	RLA-7C6-T	Low Pass Filter Coil
L ₅	RLA-7C7-T	Loading Coil
L ₆	RLA-7C2-T	Receiver Antenna Coil
L ₇	RLD-7C6-T	Receiver RF Coil
L ₈	RLO-7C4-T	Receiver Oscillator Coil
T ₁	RLI-7C12	Ceramic Filter
T ₂	RLI-2C250-T	2nd IF Transformer
T ₃	RLI-2C451-T	3rd IF Transformer
T ₄	RLT-3F15(S)	Input Transformer, P=5KΩ : S=2.5KΩ
T ₅	RLT-4S1(S)	Output Transformer, P=750Ω : S=8Ω
SPEAKER AND EARPHONE		
SP	EAS-6P81S	6 cm (2 1/4") PM Dynamic Speaker, 8Ω
EP	EAE-1RB	Magnetic Earphone, 8Ω

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Ref. No.	Part No.	Description
SWITCHES		
S ₁ ~S ₆ S ₇ ~S ₈	RSH-5-1 RSS-14	Push To Talk Switch Channel Selector Switch
MISCELLANEOUS		
	RJP-44 RJJ-13-1 RJJ-47-1 RJJ-51-1 RJS-20 RJA-23-2 RJT-709-1 RJT-717 RJE-3-1 RUD-87 RUV-169 RUS-47-1 RMM-24 RMS-11 RMX-145-1 RMY-49 RBE-21 RBX-33 DM3-6R ⊕B2-8N ⊕B3-6N ⊕B3-8N ⊕B3-8R RNT-302	Plug, Current Check Point (2 Req'd) Jack, Earphone Jack, EXT Power Source Jack, Microphone Socket, Crystal (8 Req'd) Cord, EXT Power Source Shorting Ring, Current Check Point Terminal, Whip Antenna Adaptor, Battery Spacer, Cabinet Back Cover Cover, EXT Power Source Jack Spring, Push To Talk Bracket, Level Meter Bracket, Speaker (2 Req'd) Bracket, Whip Antenna (Plastic) Heat Sink, Transistor (TR ₉ & TR ₁₀) Spring, Knob (RBB-9) Screw, Cabinet Back Cover M'tg. Red Screw, Chassis M'tg. (5 Req'd) Screw, EXT Power Source Jack M'tg. (4 Req'd) Screw, Cabinet Back Cover (2 Req'd) Screw, Cabinet Back Cover Red Screw, Whip Antenna Washer, Cabinet Back Cover (2 Req'd)
APPEARANCE		
	RYA-2780 RKM-1232 RKF-980 RKK-59-1 RGC-650 RGB-5 RGB-199 RGT-1030 RMK-91 RGX-273 RGX-277 RGX-280 RGX-282 RGK-169 RGK-240 RGK-262 RBN-46-2 RBB-9 RBC-24 RBC-29 RJK-3001 RJK-3002 RANT160-11-1 V-203	Cabinet Complete Cabinet Only Cover Only, Cabinet Back Cover Only, Cabinet Upper Side Escutcheon Badge, National Mark Badge, NATIONAL PANASONIC Mark Name Plate Ornament, Earphone & Microphone Jack Ornament, Push To Talk Switch Ornament, Level Meter Ornament, Button Ornament, Channel Selector Switch Indicating Plate, SQUELCH & VOLUME Mark Indicating Plate, Channel Selector Switch Mark Indicating Plate, Battery Case Knob, Squelch & Volume Knob, Channel Selector Switch Button, Battery Case Button, Push To Talk Switch Case, Battery Cover, Battery Case Whip Antenna, 145 cm Level Meter